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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
10/010,963	11/09/2001	Chu-Fei Chang	ARC002US	5685	
27906	7590 10/14/2005		EXAM	EXAMINER	
PATENT LAW OFFICES OF DAVID MILLERS			STREGE,	STREGE, JOHN B	
6560 ASHFIELD COURT SAN JOSE, CA 95120			ART UNIT	PAPER NUMBER	
, , ,			2625		
			DATE MAILED: 10/14/2009	DATE MAILED: 10/14/2005	

Please find below and/or attached an Office communication concerning this application or proceeding.

		Application No.	Applicant(s)				
		10/010,963	CHANG ET AL.				
	Office Action Summary	Examiner	Art Unit				
		John B. Strege	2625				
Period fo	The MAILING DATE of this communication Reply	on appears on the cover she	et with the correspondence a	ddress			
WHI0 - Exte after - If NO - Failt Any	IORTENED STATUTORY PERIOD FOR CHEVER IS LONGER, FROM THE MAIL. Insions of time may be available under the provisions of 37 SIX (6) MONTHS from the mailing date of this communication of period for reply is specified above, the maximum statutor are to reply within the set or extended period for reply will, it reply received by the Office later than three months after the patent term adjustment. See 37 CFR 1.704(b).	NG DATE OF THIS COMM CFR 1.136(a). In no event, however, r tion. y period will apply and will expire SIX (6 by statute, cause the application to become	IUNICATION. may a reply be timely filed by MONTHS from the mailing date of this ome ABANDONED (35 U.S.C. § 133).				
Status							
1)⊠	Responsive to communication(s) filed or	n <i>20 July 2005</i> .					
		This action is non-final.					
3) Since this application is in condition for allowance except for formal matters, prosecution as to the							
·	closed in accordance with the practice u	nder <i>Ex parte Quayle</i> , 1935	C.D. 11, 453 O.G. 213.				
Disposit	ion of Claims						
4)⊠	4)⊠ Claim(s) <u>1-7,9-19 and 28-39</u> is/are pending in the application.						
	4a) Of the above claim(s) is/are withdrawn from consideration.						
5)[•						
6)⊠	· · · · · · · · · · · · · · · · · · ·						
7)🛛							
8)□	Claim(s) are subject to restriction	and/or election requiremen	t.				
Applicat	ion Papers						
9)	The specification is objected to by the Ex	aminer.					
	The drawing(s) filed on is/are: a)[d to by the Examiner.				
,—	Applicant may not request that any objection	•	•				
	Replacement drawing sheet(s) including the			CFR 1.121(d).			
11)	The oath or declaration is objected to by	the Examiner. Note the atta	ched Office Action or form P	TO-152.			
Priority ι	ınder 35 U.S.C. § 119						
12)	Acknowledgment is made of a claim for fo	oreign priority under 35 U.S	.C. § 119(a)-(d) or (f).				
a)	☐ All b)☐ Some * c)☐ None of:						
i	1. Certified copies of the priority documents have been received.						
i i	2. Certified copies of the priority docu	uments have been received	in Application No				
	3. Copies of the certified copies of the	e priority documents have b	een received in this National	l Stage			
	application from the International E	, , , , , , , , , , , , , , , , , , , ,					
* 5	See the attached detailed Office action for	a list of the certified copies	not received.				
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Attachmen	t(s)						
	e of References Cited (PTO-892)	4) 🔲 Interv	view Summary (PTO-413)				
	e of Draftsperson's Patent Drawing Review (PTO-9- nation Disclosure Statement(s) (PTO-1449 or PTO/		r No(s)/Mail Date e of Informal Patent Application (PT)	·O-152)			
niorr برا Pape	nation Disclosure Statement(s) (P10-1449 of P10/ r No(s)/Mail Date	6) Other	• • • • • • • • • • • • • • • • • • • •	· 102)			

Response to Amendment

1. The amendment received 7/20/05 has been entered in full.

Response to Arguments

2. Applicant's arguments filed 7/20/05 have been fully considered but they are not persuasive. Specifically the Applicant argues for claim 1 that, "Niem fails to disclose or suggest using a background containing separated marks". Examiner respectfully disagrees. In figure 1 part (a) there is disclosed the calibration pattern which forms the background for the object and as labeled contains markers in each quadrant (paragraph directly under figure 1 on page 174).

Applicant argues for claim 16 that, "Niem fails to disclose or suggest shape reconstruction using transformations from three-dimensional coordinates to two-dimensional coordinates." Examiner respectfully disagrees. Niem discloses that a camera model, which is suited for 3D reconstruction applications, is the "cahv"-model (first paragraph of section 3.3). Figure 9 discloses the transformation of real world points (thus three-dimensional points) into two-dimensional image points in the cahv-model. The volume of the cahv-model is approximated (therefore identified) using a triangular mesh (as seen in figure 11). Furthermore as described in the texture mapping section, by using the cahv camera parameters the vertices of a surface triangle are projected into the camera plane with the original image and the clipped rectangular image part containing the projected triangle is defined as texture map (thus identifying the volume of the object as containing the points that the transform maps onto the silhouette of the object).

For claim 28, the Applicant uses the same arguments used for claim 1, thus the same response to the argument used for claim 1 applies to claim 28.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- 4. Claims 1,5-7,9-10,14,16-19, and 28-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Niem et al. in the IEEE published article *Automatic Reconstruction* of 3D Objects Using a Mobile Monoscopic Camera (as cited in the Information Disclosure Statement, hereinafter "Niem").

Regarding claim 1, Niem discloses an image processing method comprising: analyzing a plurality of images of an object on a background that contains a plurality of separated marks, (2nd paragraph of the introduction page 173, further seen in figure 1 page 174 and paragraph directly under figure 1, the identified marks are separated from the object in the image as seen in figure 1) wherein for each image, analyzing comprises: analyzing the image to identify one of the marks from among a plurality of marks in a background of the object (first paragraph of section 3, paragraph under figure 1 on page 174, as seen in figure 1 the marks are in the background); identifying locations of a plurality of calibration points on the mark identified (2nd paragraph of section 3.2 on page 175); and using the calibration points in determining camera parameters for the image (1st paragraph of section 3); and generating a three-

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dimensional model of the object from the images and the camera parameters determined from the images (see at least the abstract and section 4).

Regarding claims 5-6, Niem discloses setting the object in an area enclosed by the calibration pattern (as seen in figure 1). As the calibration pattern is defined on a plane this can be read as a sheet.

Regarding claim 7, Niem discloses allowing for free movement of the camera and an independent choice of focus (2nd paragraph from the bottom of the 2nd column on page 173).

Regarding claim 9, Niem discloses determining a transform from threedimensional coordinates to two dimensional coordinates as seen in figure 9.

Regarding claim 10, Niem discloses identifying a silhouette of an object(as seen in figure 10); applying the transform for the selected image to three-dimensional coordinates of points from a candidate volume and constructing an approximate volume of the object from the points that the transform maps from the candidate volume on to the silhouette of the object in the selected image (sections 4.1 and 4.2 on pages 177-178).

Regarding claim 14, Niem discloses approximation the volume model using a triangle mesh (as seen in figure 11).

Regarding claim 16, Niem discloses analyzing a set of images containing an object and a background (already discussed above) to identify for each image a silhouette of an object and locations in the image of pattern points in the background (1st paragraph of section 4.1); for each image, using the locations of the pattern points to

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determine a transform from three-dimensional coordinates to two-dimensional coordinates in the image and transforming three-dimensional coordinates of a set of points in a candidate volume to the two-dimensional coordinates of a first of the images (section 3.3 and figure 9 on page 176); and identifying an approximate volume of the object as containing the points that the transform maps onto the silhouette of the object in the first of the images (as seen in figure 11).

Regarding claim 17, Niem discloses approximating the volume model by using a triangle mesh (as seen in figure 11).

Regarding claim 18, Niem discloses texture mapping in section 4.2 on page 178.

Regarding claim 19, Niem discloses that the calibration and reconstruction is carried out for each of the multiple input images (section 6).

Regarding claim 28, Niem discloses a reconstruction engine (section 4) comprising an extraction unit capable of processing an image of an object on a background containing a plurality of marks that are separated from each other, wherein the processing includes identifying one of the marks that is separated from the object in the image (this limitation was discussed above) extracting a silhouette of the object and determining locations of calibration points on the mark identified (as seen in figure 10 and two paragraphs following figure 10) a volume generator that receives the locations from the extraction unit, determines a transform for the image, and determines three-dimensional coordinates of points on a surface of the object from the transform and the silhouettes (summary section on pages 179-180); and a reconstruction unit that

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constructs a three-dimensional model of the object from the three-dimensional coordinates of the points on the surface of the object (section 4.1 on page 177).

Regarding claim 29, Niem discloses that the algorithms used for the silhouette extraction and volume generator are software (paragraph under figure 10 as well as the abstract).

Regarding claim 30, as the reconstruction engine is on software it is executable on a computer.

Claim Rejections - 35 USC § 103

- 5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:
 - (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
- 6. Claims 2-4, 11-13, 15, 31-32, and 35-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Niem et al. in the IEEE published article *Automatic*Reconstruction of 3D Objects Using a Mobile Monoscopic Camera (as cited in the Information Disclosure Statement, hereinafter "Niem").

Claims 2-4 are dependent on claim 1 (anticipated by Niem) and include the further limitation that the mark comprises a first rectangular segment having corners that are among the calibration points. Niem discloses that the position markers are inside rectangular quadrants (figure 1 and paragraph directly following it). Niem does not explicitly disclose that the corners of the mark are among the calibration points.

However Niem does disclose that for the identification of the calibration points, at least

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one position marker and its two neighboring line segments have to be detected (second paragraph of section 3.2).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the corners of the quadrants as calibration points. Applicant has not disclosed that using the corners provides an advantage, is used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with Niem's invention because it is calibrating the camera using calibration points that are in the center of the quadrant, thus the end result of calibration is the same.

Therefore, it would have been obvious to combine using the corners of the calibration marks with Niem to obtain the invention as specified in claims 2-4.

Claims 31-32 disclose similar limitations to claims 2-4, thus the same arguments applied for claims 2-4 apply equally to claims 31-32.

Claims 11-12 describes determining whether or not the model is suitable and if it is unsuitable performing the steps of claims 9-10 until it is suitable. Niem does not explicitly disclose determining whether or not the model is suitable and repeating the steps performed until it is suitable but it would be obvious to do so since it is well known that the more data that for a passive three dimensional model to be suitable requires a number of input images, and if the model is unsuitable then more input images should be added. The motivation for doing so would be to have a model of sufficient quality for whatever purposes necessary.

Regarding claims 13 and 15, Niem discloses analyzing the image using software that distinguishes the silhouette of the object from the background (as seen in the second column of page 177). Niem does not explicitly disclose providing a user with a method for modifying of the silhouette. It is well known in the art of image processing to allow a user to modify an image, thus the examiner declares official notice. It would be obvious to one of ordinary skill in the art to modify a silhouette because images may arise in which the computer can not achieve the same quality of recognition of the silhouette as the human eye, thus the user would be able to judge this and make the necessary improvements.

Regarding claim 35, Niem discloses selecting the candidate volume based on a position of the silhouette relative to the pattern points in one of the images (first paragraph of section 4.1, and the two paragraphs under figure 10).

Regarding claim 36, the object in figure 10 is three-dimensional thus it has points with coordinates x,y, and z which are within a corresponding range.

Regarding claim 37, the volume model surface further triangles are constructed at each open edge until the whole volume model is covered with a mesh (last paragraph on page 177).

7. Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Niem et al. in the IEEE published article *Automatic Reconstruction of 3D Objects Using*

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a Mobile Monoscopic Camera (as cited in the Information Disclosure Statement, hereinafter "Niem") and further in view of Eylon USPN 5,867,590.

Niem does not explicitly disclose using asymmetrical marks to determine the orientation of a reference axis. Niem uses symmetrical marks to determine the orientation. However it is well known to use asymmetrical marks to determine the orientation of a reference axis. Eylon discloses determining the directions of the grid lines relative to the directiona of a reference coordinate system, detecting an asymmetrical directional feature, its orientation with respect to the directions of the grid lines and the distance of the asymmetrical feature from a geometrical center of the surface being known (see the abstract).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Niem and Eylon to use asymmetrical marks to identify the reference axis. The motivation is that Eylon discloses that asymmetrical marks are useful for position location. Thus it would have been obvious to one of ordinary skill in the art to combine Niem and Eylon to obtain the invention as specified in claims 33-34.

Allowable Subject Matter

8. Claims 38-39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B. Strege whose telephone number is (571) 272-7457. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS

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